

Erosion along the east bank of the Kuguklik River near the Corporation Hardware Store and the proposed tank farm sites was evaluated using aerial photos and a survey conducted in November of 2008 by LCMF.

Aerial photographs from 1963, 1983, 1996, 2002, and 2004 were compared to the current shoreline conditions found during LCMF's November 2008 survey. The resulting shoreline erosion of the Kuguklik River is presented on the attached Erosion Study Drawing (Fig. 2).

Shoreline locations at various stages over the past 45 years indicate that the river channel in front of the village is realigning as the upstream river approach swings to the south. As the river moves to the east, the angle point in the main river channel moves to the north shifting main erosion impact area further upstream. This change is typified by the shift in extensive shoreline erosion from in front of the village between 1963 and 1983, to the mouth of the slough between 1983 and 1996, to the current location upstream of the mouth of the slough between 1996 and 2008.

The current area of significant erosion is between the Corporation Hardware Store and the Corporation fuel dispensing station. There has been some significant erosion in this area over the past six years, up to 100 ft in some areas. Erosion distances between 60 and 90 feet have occurred in this area between 2004 and 2008. The corresponding annual erosion rate in this area is 18.8 feet per year while past erosion rates have typically peaked around 10 feet per year.

A portion of the increase in erosion can be attributed to the narrow channel width at this point in the river. The current channel near the hardware store and dispensing station narrows which increases the velocity along the outside (eastern) shoreline. This increased velocity accelerates erosion by carrying away soil at higher rates. Points further downstream, where the channel widens, have lower erosion rates, correlating to the slower velocities in the wider channel. As the erosion progresses in the area of the dispensing station the channel will widen which will result in slower river velocities reducing the erosion rate.

This increased erosion in this area is also partially the result of the formation of an island from a braid in the slough which has now disappeared. What was previous the bank of the slough has become the eastern bank of the river. When the river claimed this portion of the slough the shoreline north of this area became more exposed to river currents contributing to the accelerated erosion.

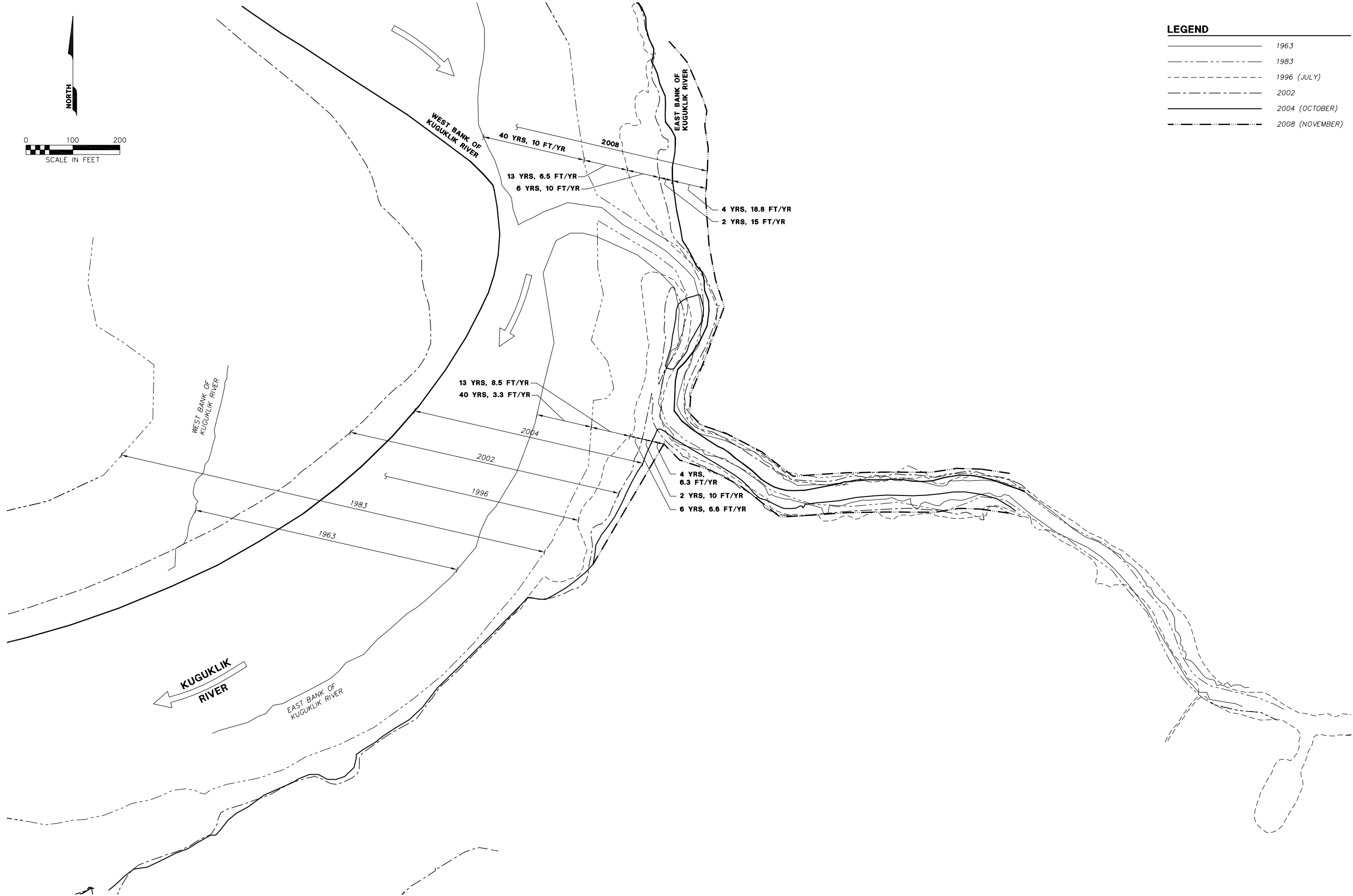
Another reason for accelerated erosion may be due to the presence of different soils that are more susceptible to erosion such as an old lake bed, degraded vegetation from local activity, or possibly areas of degraded permafrost.

As a result of all of the above factors it is anticipated that the erosion rate in this area will reduce to more traditional rates of 6 to 10 feet per year in the future.

Based on the current erosion rates and the transition to slower rates in the next several years, it appears that the new tank farm site will not be endangered by erosion for well beyond the design life of the facility. The proposed bulk tank farm will be located about 680 feet from the edge of the river bank as recorded November of 2008. Assuming that the current erosion rate of 20 feet per year continues for the next 10 years, and then the traditional maximum rate of 10 feet per year occurs after this point, it would take almost 50 years for the river bank to erode within 100 feet of the tank farm site.

There is a danger of erosion impacting the existing Corporation tanks within a few years and an immediate risk of erosion undermining the existing gas station and marine header. The new marine header should be located 100 or more feet away from the shoreline, and provisions made for removing a 100 ft segment of the pipeline in the future to move the header and dispensing station away from the shoreline as it erodes.

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CONCEPTUAL DESIGN REPORT		REVISIONS:	
DRAWN BY: MAR CHECKED BY: GMO DATE: 12/19/08 JOB NUMBER: 08-403 SCALE: AS SHOWN		DRAWING TITLE: EROSION STUDY PLAN	
SHEET: OF		FIG.2	

